

DOUBLE-BLIND CONTROLLED COMPARISON OF ALPHA-LINOLENIC, LINOLEIC AND MARINE N-3 FATTY ACIDS ON BLOOD PRESSURE AND PLASMA LIPIDS

M. KESTIN, P. CLIFTON and P.J. NESTEL

Fish oils containing polyunsaturated n-3 fatty acids have been reported to lower blood pressure and plasma triglyceride concentrations (Leaf and Weber 1988) - it is unclear whether alpha-linolenic acid, the parent compound of the n-3 series, is capable of duplicating these effects. Indeed, the extent of conversion in man of alpha-linolenic acid to longer chain n-3 fatty acids is unresolved (Adam, Wolfram and Zollner 1986). We therefore have compared the comparative efficacy of these n-3 fatty acids, together with linoleic acid in a double blind controlled trial.

Thirty-three normotensive, mildly hypercholesterolaemic men completed the study. They were equilibrated on a low fat, (about 25% energy from fat) low polyunsaturated fat (less than 3% energy from polyunsaturated fat) diet supplemented with a 'safflower oil' beverage for 18 days. They were then randomly allocated, double-blind, to continue on the diet and 'safflower oil' or to consume a 'linseed oil' or 'fish oil' supplement. The supplements were designed to contribute 10% of energy from fat as a fat mixture providing either 1.4g EPA/DHA [eicosapentanoic acid/docosahexanoic acid ('fish oil' supplement)], 3.8g alpha-linolenic acid ('linseed' supplement) or 5.9g linoleic acid ('safflower' supplement) per 1000 Kcal. The drinks contained the same total quantity of saturated, monounsaturated, polyunsaturated fatty acids and cholesterol. Blood pressure was measured and blood samples taken on three consecutive days at the end of the initial equilibration period, two and four weeks, on three consecutive days at the end of the intervention and four weeks after completion of the intervention.

Compared to linoleic acid, fish oil lowered systolic blood pressure (4.5 mmHg $P < 0.01$), plasma VLDL-cholesterol (0.2 mmol/l $P < 0.01$) and triglycerides (0.51 mmol/l, $P < 0.001$). Alpha-linolenic acid had no significant effect. There were no significant differences between any of the groups for plasma total cholesterol or diastolic blood pressure. However, in comparison to the other two groups, fish oil raised the concentration of LDL-cholesterol (0.18 mmol/l, $P < 0.01$). Analysis of plasma fatty acids revealed that fish oil increased the relative EPA content seven fold and DHA three fold; linseed oil increased EPA (two-fold) and timnodonic acid (C22:5, n-3) but had only a marginal effect on DHA levels. There was a good correlation ($r = -0.73$, $P < 0.01$) between decrease in plasma triglyceride concentration and increase in plasma EPA content, for the fish oil group only.

N-3 fatty acids in fish oil (EPA and DHA) lower systolic blood pressure and triglyceride concentrations, but raise LDL-cholesterol concentrations in normotensive men; despite some limited conversion to EPA, alpha-linolenic acid does not exert the same effects over a six week supplementation period.

LEAF, A. and WEBER, P.C. (1988). New Engl.J.Med. 318: 549.

ADAM, O., WOLFRAM, G. and ZOLLNER, N. (1986) J.Lipid Res. 27: 421